

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listing, of claims in the application:

Listing of claims:

Claims 1- 36 (CANCELED)

37. (CURRENTLY AMENDED) A CMP retaining ring, comprising:

an inner peripheral surface;

an outer peripheral surface;

a lower surface adapted to contact and depress an upper surface of a polishing pad during chemical mechanical polishing of a lower surface of a substrate;

a plurality of grooves on said lower surface of said CMP retaining ring; each groove of said plurality of grooves continuously extends entirely across the lower surface extending from said inner peripheral surface to said outer peripheral surface;

said plurality of grooves are spaced apart;

said plurality of grooves include at least a first groove and a second groove;

at least a portion of said first groove not adjacent to the lower surface has a rounded cross sectional contour ~~or slanted cross sectional contour~~; whereby the rounded cross sectional contour reduces the accumulation of particles in the grooves that reduces microscratches.

38. (CURRENTLY AMENDED) The CMP retaining ring of claim 37 wherein said lower surface of said retaining CMP ring is essentially flat with only said plurality of grooves therein.

39. (CURRENTLY AMENDED) The CMP retaining ring of claim 37 wherein said plurality of grooves do not intersect; said plurality of grooves do not communicate with each other; each groove of said plurality of grooves only communicates ~~communicate~~ between said inner peripheral surface and said outer peripheral surface; said first groove forms a first inner

peripheral surface opening in the inner peripheral surface and a first outer peripheral surface opening in the outer peripheral surface.

40. (CURRENTLY AMENDED) The CMP retaining ring of claim 37 wherein said plurality of grooves are linear; and each groove of said plurality of grooves ~~are~~ is uninterrupted extending continuously the entire distance from said inner peripheral surface to said outer peripheral surface; said lower surface does not comprise an annular recess.

41. (CURRENTLY AMENDED) The CMP retaining ring of claim 37 wherein said first groove has a semicircle cross sectional profile along said first groove's entire length; and wherein said second groove has a semicircle profile along said second groove's entire length; each groove of the plurality of grooves communicates between the inner peripheral surface and the outer peripheral surface.

42. (CURRENTLY AMENDED) The CMP retaining ring of claim 37 wherein each groove of said plurality of grooves has ~~have~~ a semicircle cross sectional profile along the entire length extending continuously in said lower surface the entire distance from said inner peripheral surface to said outer peripheral surface.

43. (CURRENTLY AMENDED) The CMP retaining ring of claim 37 wherein said first groove has a semicircle cross sectional profile and said first groove has a rounded top corner adjacent to the lower surface of the CMP retaining ring.

44. (CURRENTLY AMENDED) The CMP retaining ring of claim 37 wherein said first groove has a semicircle cross sectional profile; ~~with a radius between 2 and 15 mm~~

and said first groove has a rounded top corner adjacent to the lower surface of the CMP retaining ring;

each groove of said plurality of grooves is linear.

45. (PREVIOUSLY PRESENTED) The CMP retaining ring of claim 37 wherein said first groove is comprised of: sidewalls, a flat horizontal bottom, and rounded bottom corners

between said sidewalls and said flat bottom;

said first groove has curved sidewalls with a curved cross sectional shape.

46. (PREVIOUSLY PRESENTED) The CMP retaining ring of claim 37 wherein said first groove has rounded corners adjacent to a bottom of said first groove.

47. (CURRENTLY AMENDED) The CMP retaining ring of claim 37 wherein said first groove has rounded top corners adjacent to the lower surface of said CMP retaining ring.

48. (CURRENTLY AMENDED) The CMP retaining ring of claim 37 wherein said first groove has vertical sidewalls and an about horizontal bottom and at least one rounded corner between said sidewalls and said horizontal bottom; and rounded top corners near the lower surface of said CMP retaining ring.

49. (PREVIOUSLY PRESENTED) The CMP retaining ring of claim 37 wherein said first groove has straight sidewalls, top corners, bottom corners; and an about horizontal bottom, said bottom corners are rounded or curvilinear; said bottom corners are adjacent to said horizontal bottom and straight sidewalls.

50. (CURRENTLY AMENDED) A CMP retaining ring, comprising:

an inner peripheral surface;

an outer peripheral surface;

a lower surface adapted to contact and depress an upper surface of a polishing pad during chemical mechanical polishing of a lower surface of a substrate;

a plurality of grooves on said lower surface of said CMP retaining ring; and each groove of said plurality of grooves continuously extends extending the entire distance from said inner peripheral surface of said CMP retaining ring, to said outer peripheral surface of said

CMP retaining ring; said first groove forms a first inner peripheral surface opening in the inner peripheral surface and a first outer peripheral surface opening in the outer peripheral surface;
each groove of said plurality of grooves communicates between said inner peripheral surface and said outer peripheral surface;

said plurality of grooves are spaced apart; said plurality of grooves only communicate between said inner peripheral surface and said outer peripheral surface;

said plurality of grooves include at least a first groove and a second groove;

at least a portion of said first groove not adjacent to the lower surface has a rounded cross sectional contour ~~or slanted cross sectional contour~~;

each groove of said plurality of grooves has a rounded cross sectional contour along the entire length of the groove: whereby the rounded cross sectional contour reduces the accumulation of particles in the grooves that reduces microscratches.

51. (CURRENTLY AMENDED) The CMP retaining ring of claim 50 wherein each groove of said plurality of grooves ~~are~~ is uninterrupted continuously extending from said inner peripheral surface to said outer peripheral surface; said lower surface does not comprise an annular recess.

52. (CURRENTLY AMENDED) The CMP retaining ring of claim 50 wherein said first groove has a semicircle cross sectional profile along the entire length of said first groove.

53. (CURRENTLY AMENDED) The CMP retaining ring of claim 50 wherein said first groove has a semicircle cross sectional profile and said first groove has a rounded top corner adjacent to the lower surface of the CMP retaining ring.

54. (CURRENTLY AMENDED) The CMP retaining ring of claim 50 wherein said first groove has a semicircle cross sectional profile[[]] ;

said plurality of grooves are linear; and
each groove of said plurality of grooves ~~are~~ is uninterrupted extending from said inner peripheral surface to said outer peripheral surface;
said lower surface does not comprise an annular recess.

55. (CURRENTLY AMENDED) A process for chemical-mechanical polishing a substrate comprising:

said substrate is disposed within a polishing head facing a polishing table;
said substrate is retained within the polishing head by a retainer ring, and

said retaining ring is comprised of:

an inner peripheral surface;

an outer peripheral surface;

a lower surface adapted to contact and depress an upper surface of a polishing pad during chemical mechanical polishing of a lower surface of the substrate;

a plurality of grooves on said lower surface of said retaining ring; each groove of said plurality of grooves continuously extends entirely across the lower surface extending from said inner peripheral surface of said retaining ring to said outer peripheral surface of said retaining ring; each groove of said plurality of grooves communicates between said inner peripheral surface and said outer peripheral surface;

said plurality of grooves are spaced apart;

said plurality of grooves only communicate between said inner peripheral surface and said outer peripheral surface;

said plurality of grooves include at least a first groove and a second groove;

at least a portion of said first groove not adjacent to said lower surface has a rounded cross sectional contour ~~or slanted cross sectional contour;~~ whereby the rounded cross

sectional contour reduces the accumulation of particles in the grooves that reduces microscratches;

supplying a slurry to said polishing table or to said polish head;
moving the polishing table and/or the polishing head to chemically polish the substrate.

56. (PREVIOUSLY PRESENTED) The process of claim 55 which further includes: said substrate is a wafer; forming a deposition layer on the surface of said wafer and chemical mechanically polishing said deposition layer.

57. (CURRENTLY AMENDED) The process of claim 55 wherein said first groove has a semicircle cross sectional profile along the entire length extending continuously the entire distance from said inner peripheral surface to said outer peripheral surface; said first groove forms a first inner peripheral surface opening in the inner peripheral surface and a first outer peripheral surface opening in the outer peripheral surface.

58. (CURRENTLY AMENDED) The process of claim 55 wherein said first groove has a semicircle cross sectional profile and said first groove has a rounded corner adjacent to the lower surface of the retaining ring.

59. (CURRENTLY AMENDED) The process of claim 55 wherein each groove of said plurality of grooves ~~are~~ is uninterrupted extending continuously from said inner peripheral surface to said outer peripheral surface;

said lower surface does not comprise an annular recess;

said first groove has a semicircle profile along the entire length extending continuously the entire distance from said inner peripheral surface to said outer peripheral surface; said first groove forms a first inner peripheral surface opening in the inner peripheral surface and a first outer peripheral surface opening in the outer peripheral surface;

said first groove has a semicircle cross sectional profile and said first groove has a rounded corner adjacent to the lower surface of the retaining;
said plurality of grooves are linear.

60. (PREVIOUSLY PRESENTED) The process of claim 55 wherein said first groove has rounded edges adjacent to the bottom of said first groove.

61. (PREVIOUSLY PRESENTED) The process of claim 55 wherein said first groove has rounded top edges adjacent to the lower surface of said retaining ring.